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(71) Applicant: Sony Corporation

(72) Inventor: Hiroyuki Ihara

(72) Inventor: Takuya Igarashi

(54) [Title of the Invention] Printer

(57) [Abstract]

[Object] The printer according to the present invention is capable of definitely executing print processing, even if a plurality of electric devices send individual print requests at approximately the same time.

[Solving Means] An I/F 13a receives a print request sent by an STB 11 which is an external electric device. In response to the print request received by the I/F 13a, a CPU 13b assigns a logical functional block in charge of executing processing. The CPU 13a sends information indicating the logical functional block assigned by the assigning means, via the I/F 13a, to the STB 11 which is the external electric device having sent the request. The STB 11 sends print data to the assigned functional block. A print engine 13d supplies the sent data to the corresponding functional block for executing printing.

[Claims]

[Claim 1] A printer including an interface in compliance with an IEEE1394 standard, the printer comprising:

receiving means for receiving a print request sent by an external electric device;

assigning means for assigning a logical functional block in charge of executing processing, in response to the print request received by the receiving means; and

sending means for sending information indicating the logical functional block assigned by the assigning means to the external electric device which has sent the request.

[Claim 2] The printer according to Claim 1, wherein the receiving means is compliant with an AV/C protocol.

[Claim 3] The printer according to Claim 1, wherein, when there are a plurality of the functional blocks, the assigning means assigns the plurality of the functional blocks in the order of requests received.

[Claim 4] The printer according to Claim 1, wherein, when a connection request is received from an electric device different from the electric device to which the assignment has been made by the assigning means, the request received from the electric device is rejected.

[Detailed Description of the Invention]

[0001]

[Technical Field of the Invention] The present invention

relates to a printer, and more particularly to a printer including an interface in compliance with an IEEE1394 standard.

[0002]

[Description of the Related Art] An IEEE (Institute of Electrical and Electronics Engineers) 1394 interface uses an isochronous transfer method suitable for transferring multimedia data, such as sounds, images, and the like, which need to be transferred in real time. The use of the IEEE1394 interface is spreading mainly in personal computers and audio-video equipment.

[0003] Meanwhile, in recent years, a DPP (Direct PrintProtocol) has been being widely used which enables direct connection of a digital camera or the like with a printer through the IEEE1394 interface, and thus which enables execution of printing without interposition of a personal computer (i.e., direct printing). In particular, an AV/C (Audio Visual/Control) protocol, which is used mainly in an AV (Audio Visiual) field, has been drawing attention.

[0004]

[Problems to be Solved by the Invention] Meanwhile, according to the AV/C protocol described above, a corresponding relationship between a job, which is a unit of processing, and a subunit plug, which is a functional block

of the printer, is not clearly specified in a controller of the digital camera or the like. As a result, there arises a problem that, if there are a plurality of controllers, and if the plurality of controllers send individual requests at approximately the same time, a subunit secured by a job may be seized by another job, and thus printing may not be normally executed. A specific example of this problem is described below.

[0005] Fig. 7 is a diagram illustrating a case in which two controllers C1 and C2 are connected to a printer P via the IEEE1394 interface. In this case, the controllers C1 and C2 are, for example, digital cameras or STBs (Set Top Boxes). The printer P is in compliance with the AV/C protocol, and has a subunit (SUBUNIT) PS serving as a logical functional block for the controllers C1 and C2. In some cases, the subunit has subunit plugs (SUBUNIT_PLUG) serving as a plurality of input ports. The present example, however, illustrates a case in which the subunit has a single subunit plug.

[0006] With reference to Fig. 8, description is first made of processing executed when either one of the controllers sends a print request. At a time t1, the controller 1, for example, sends the printer P a SUBUNIT_INFO for detecting a party connected thereto.

[0007] When the printer is detected, at a time t2, the

controller C1 sends the detected printer a JOB_QUEUE which is a print request. An "add_job" in parentheses is a parameter indicating a request for creation of a new queue.

[0008] At a time t3, the controller C1 sends the printer P an OPERATION_MODE for setting an output format on a print sheet. At a time t4, the controller C1 sends the printer P an ALLOCATE for securing a plug (i.e., a physical functional block) of the printer (unit).

[0009] At a time t5, an ATTACH is sent which is a declaration to actually use the plug secured by the ALLOCATE. At a time t6, the controller C1 sends the printer P a CONNECT (UNIT 0, SUBUNIT 0) for requesting connection of a SUBUNIT 0, which is the functional block secured by the ALLOCATE, with a UNIT 0, which is one of a plurality of units included in the printer.

[0010] At a time t7, a CAPTURE (RECEIVE, SUBUNIT 0) is sent to the printer P for requesting reception of data. As a result, at a time t8, the printer P sends back an INTERIM for adjusting timing.

[0011] At times t9 and t10, data transfer processing is executed. At a time t11 and thereafter, processing for completing the data transfer is executed. With reference to Fig. 9, description is then made of operations performed when the two controllers C1 and C2 send individual print requests at approximately the same time.

[0012] In an example illustrated in Fig. 9, the controllers C1 and C2 send the SUBUNIT_INFO for detecting a party connected thereto, at times t1 and t2, respectively.

[0013] Thereafter, the respective controllers perform operations similar to the operations described above. At times t9 and t10, the controllers C1 and C2 send the ATTACH, respectively.

[0014] Meanwhile, conventionally, declaration of which controller uses which subunit plug cannot be previously made. Therefore, each of the controllers arbitrarily declares the subunit plug it will use, and starts transferring data. In the example illustrated in Fig. 9, immediately after the controller C1 has established its connection with the subunit plug "0" at the time t11, the controller C2 connects to the same subunit plug "0" at a time t12. As a result, the connection of the subunit plug "0" established with the controller C1 is changed to connection with the controller C2. Thus, if the controller C1 sends data in this state, incorrect data is sent to a job used by the controller C2.

[0015] In the example described above, there is only one subunit plug. However, even if there are a plurality of subunit plugs, operations similar to the operations described above are performed. Thus, a false operation occurs.

[0016] As described above, according to the conventional

method, the declaration of which controller uses which subunit plug cannot be previously made. Therefore, there arises a problem, such as occurrence of a failure to normally execute printing, when a plurality of controllers send individual print requests at approximately the same time.

[0017] The present invention is made in light of the above circumstances, and the object of the present invention is, therefore, to provide a printer capable of normally executing printing even if a plurality of controllers send individual print requests at approximately the same time.

[0018]

[Means for Solving the Problems] To solve the problems described above, the present invention provides a printer 13 including an interface in compliance with an IEEE1394 standard, as illustrated in Fig. 2. The printer 13 includes receiving means (I/F 13a) for receiving a print request sent by an external electric device (STB 11), assigning means (CPU 13b) for assigning a logical functional block in charge of executing processing, in response to the print request received by the receiving means, and sending means (I/F 13a) for sending information indicating the logical functional block assigned by the assigning means to the external electric device which has sent the request.

[0019] In this case, the receiving means (I/F 13a) receives

the print request sent by the external electric device (STB 11). In response to the print request received by the receiving means, the assigning means (CPU 13b) assigns the logical functional block in charge of executing processing. The sending means (I/F 13a) sends the information indicating the logical functional block assigned by the assigning means to the external electric device which has sent the request.

[0020]

[Embodiments] Hereinafter, embodiments of the present invention are described with reference to the drawings. Fig. 1 is a diagram illustrating an example of a configuration according to an embodiment of the present invention.

[0021] In the figure, a parabola antenna 10 receives radio waves sent by a broadcast satellite not illustrated. An STB 11 decodes the radio waves received by the parabola antenna 10, extracts therefrom picture signals and the like, and supplies the extracted picture signals and the like to a monitor 12 and the printer 13.

[0022] The monitor 12 includes, for example, a CRT (Cathode Ray Tube) monitor, and outputs for displaying the picture signals output by the STB 11. The printer 12 converts a variety of print information extracted by the STB 11 into a layout-raster image, and prints the image on a print sheet.

[0023] Fig. 2 is a diagram illustrating an example of a detailed configuration of the STB 11 and the printer 13. As

illustrated in the figure, the STB 11 includes an F/E (Front End) 11a, a DES (Descrambler) 11b, an I/F (Interface) 11c, a DEMUX (Demultiplexer) 11d, an AV decoder 11e, an NTSC (National Television System Committee) encoder 11f, a CPU (Central Processing Unit) 11g, and a RAM (Random Access Memory) 11h.

[0024] The F/E 11a demodulates and digitizes the radio waves supplied by the parabola antenna 10, and converts the radio waves into a stream multiplexing image data, sound data, and the like. The DES 11b cancels the scrambling performed on the stream extracted by the F/E 11a, and then outputs the stream.

[0025] The I/F 11c, which is an interface in compliance with the IEEE1394 standard, extracts print information from the stream unscrambled by the DES 11b, and supplies the print information to the printer 13. Alternatively, the I/F 11c may supply the image data supplied by the CPU 11g to the printer 13.

[0026] The DEMUX 11d decodes the stream multiplexing the image data, the sound data, and the like, and separately outputs the image data and the sound data. Although not illustrated, the DEMUX 11d includes a graphic RAM for storing a still image supplied by the AV decoder 11e.

[0027] The AV decoder 11e decodes the image data and the sound data supplied by the DEMUX 11d, and generates the

original picture signals and sound signals. Although not illustrated, the AV decoder 11e includes a video RAM for storing the still image decoded by the AV decoder 11e and transferring the still image, if necessary, to the graphic RAM described above.

[0028] The NTSC encoder 11f converts an image signal and a sound signal supplied by the AV decoder 11e into a picture signal in compliance with an NTSC format. The CPU 11g controls the entire device, and if a control unit (not illustrated) of the STB 11 is operated, the CPU 11g executes processing according to the operation.

[0029] When the CPU 11g executes a variety of arithmetic processing, the RAM 11h temporarily stores a program to be executed and data to be processed. A configuration of the printer 13 is then described.

[0030] The printer 13 includes an I/F 13a, a CPU 13b, a RAM 13c, and a print engine 13d. The I/F 13a is an interface in compliance with the IEEE1394 standard for exchanging data with the I/F 11c of the STB 11.

[0031] The CPU 13b controls individual parts of the device and executes a variety of arithmetic processing. The RAM 13c temporarily stores a program being executed by the CPU 13b and data being subjected to the arithmetic processing executed by the CPU 13b.

[0032] The print engine 13d, which is a part for executing

the print processing, prints the data sent by the STB 11 in accordance with the control of the CPU 13b. Operations of the embodiment described above are then described. The following example is described on the basis of an assumption that the printer 13 has two units (UNIT 0 and UNIT 1) and two subunit plugs (SUBUNIT 0 and SUBUNIT 1).

[0033] Fig. 3 illustrates a signal flow in a case in which the STB 11 illustrated in Fig. 2 sends a print request to the printer 13. First, at a time t1, the STB 11 sends the printer 13 a SUBUNIT_INFO for detecting a party connected thereto.

[0034] Then, at a time t2, the STB 11 sends a JOB_QUEUE which is a print request to the detected printer. Fig. 4 is a diagram illustrating a data configuration of the JOB_QUEUE sent at this time. As illustrated in the figure, the JOB_QUEUE includes an operation code (OPCODE) and operands (OPERAND) [0] to [28]. This JOB_QUEUE is different from a usual JOB_QUEUE in its newly expanded 4-byte OPERAND [25]. When the JOB_QUEUE is sent by the STB 11 to the printer 13, data FFh ("h" indicates a hexadecimal number) is stored in the OPERAND [25]. Upon receipt of the JOB_QUEUE, the printer 13 stores in the OPERAND [25] information indicating a subunit plug to be assigned, and sends back the information (later described in detail).

[0035] Having received the JOB_QUEUE which stores the data

FFh in the OPERAND [25], at a time t3, the printer 13 sends back an ACCEPTED indicating reception of the JOB_QUEUE. The ACCEPTED has a data configuration similar to the data configuration illustrated in Fig. 4, and stores information indicating the subunit plug to be assigned by the printer 13. In this example, there is no print request sent from a device other than the STB 11. Therefore, the subunit plug 0 (SUBUNIT 0) is assigned.

[0036] At a time t4, an OPERATION_MODE is sent for output setting. At a time t5, an ALLOCATE is sent for actually securing the subunit plug of the printer 13. At a time t6, an ATTACH is output for making a declaration to actually use the secured subunit plug.

[0037] Then, at a time t7, a request is sent by a CONNECT for connecting the UNIT 0 to the SUBUNIT 0. As a result, the SUBUNIT 0 is connected to the UNIT 0 in the printer 13 in preparation for data reception.

[0038] At a time t8, a CAPTURE (RECEIVE, SUBUNIT 0) is sent to the printer 13 for requesting reception of the sent data. Operations performed thereafter are similar to the operations illustrated in Fig. 8, and thus description of the operations is omitted.

[0039] Fig. 5 is a diagram illustrating an example of the JOB_QUEUE exchanged between the STB 11 and the printer 13. In this figure, a "CONTROL COMMAND" indicates an example of

the JOB_QUEUE sent by the STB 11 to the printer 13. Further, an "ACCEPTED RESPONSE" indicates an example of the ACCEPTED sent back from the printer 13 to the STB 11. A left-pointing arrow (←) in the figure indicates that description in a cell including the left-pointing arrow is the same as description in its left-hand cell.

[0040] As is apparent from comparison of contents of the OPERAND [25], the data FFh is stored in the OPERAND [25] and sent in response to the CONTROL COMMAND. Then, a "RESERVED SUBUNIT PLUG," which is information indicating the secured subunit plug, is stored in the OPERAND [25] and sent back.

[0041] With reference to Fig. 6, description is then made of operations performed in a case in which the printer is connected to two STBs, and the two STBs send individual requests at the same time. In the following description, the two STBs are referred to as an STB#1 and an STB#2 for the sake of convenience.

[0042] First, at a time t1, the STB#1 sends the printer 13 a SUBUNIT_INFO for detecting a party connected thereto. Then, at a time t2, the STB#2 sends the printer 13 a SUBUNIT_INFO for detecting a party connected thereto.

[0043] Subsequently, at a time t3, the STB#1 sends a JOB_QUEUE which stores the FFh in the OPERAND [25]. Then, at a time t4, the printer 13 sends back to the STB#1 an ACCEPTED which stores, in the OPERAND [25], information

indicating a subunit plug to be assigned. In the present example, the subunit plug 0 (SUBUNIT 0) is designated as the subunit plug to be assigned.

[0044] Similarly, at a time t5, the STB#2 sends a JOB_QUEUE which stores the FFh in the OPERAND [25]. Then, at a time t6, the printer 13 sends back to the STB#2 an ACCEPTED which stores, in the OPERAND [25], information indicating the subunit plug to be assigned. In the present example, the subunit plug 1 (SUBUNIT 1) is designated as the subunit plug to be assigned.

[0045] Operations performed at times t7 to t12 are similar to the operations illustrated in Fig. 9 described above, and thus description of the operations is omitted. At a time t13, the STB#1 sends a CONNECT for requesting connection of the previously designated SUBUNIT 0 with the UNIT 0.

[0046] Further, at a time t14, the STB#2 sends a CONNECT for requesting connection of the previously designated SUBUNIT 1 with the UNIT 1. At times t15 and t16, the STB#1 and the STB#2 send the printer 13 a CAPTURE (RECEIVE, SUBUNIT 0) and a CAPTURE (RECEIVE, SUBUNIT 1), respectively, for requesting reception of data. Then, at a time t17, an INTERIM is sent back by the printer 13.

[0047] Thereafter, transferring of data starts between the STB#1 and the SUBUNIT 0 and between the STB#2 and the SUBUNIT 1, and print processing is executed. If, after a

predetermined STB has created a job, an STB other than the predetermined STB sends a connection request CONNECT for requesting connection to the SUBUNIT designated to the predetermined STB, a REJECT may be sent to the STB other than the predetermined STB for rejecting the request. According to such configuration, a failure to normally execute printing due to data interference can be prevented.

[0048] Further, conventionally, in a case in which a job is automatically cancelled due to time-out or the like, a corresponding relationship between the job and its SUBUNIT is not clearly specified. Therefore, even if the job is automatically cancelled, the SUBUNIT corresponding to the job continues to be secured. According to the embodiment of the present invention, however, the corresponding relationship between the job and the SUBUNIT is known. Thus, if the job is cancelled, the secured SUBUNIT can be simultaneously cancelled. As a result, print processing can be promptly executed again after the cancellation of the job.

[0049] As described above, according to the embodiment of the present invention, even if a plurality of STBs (i.e., controllers) send the printer individual print requests, the failure to normally execute printing can be prevented.

[0050] Further, if a job is cancelled, an already secured SUBUNIT can be cancelled. As described above, therefore, the print processing can be promptly executed again after

the cancellation of the job.

[0051]

[Advantages] As described above, according to the present invention, a printer has an interface in compliance with the IEEE1394 standard. The printer includes receiving means for receiving a print request sent by an external device, assigning means for assigning a logical functional block in charge of executing processing in response to the print request received by the receiving means, and sending means for sending information indicating the logical functional block assigned by the assigning means to the external device which has sent the request. Accordingly, even if a plurality of electric devices send individual print requests, target data can be definitely printed.

[Brief Description of the Drawings]

[Fig. 1] Fig. 1 is a diagram illustrating an example of a configuration of an embodiment according to the present invention.

[Fig. 2] Fig. 2 is a diagram illustrating an example of a detailed configuration of the STB and the printer illustrated in Fig. 1.

[Fig. 3] Fig. 3 is a diagram illustrating exchange of data between the STB and the printer.

[Fig. 4] Fig. 4 is a diagram illustrating a data configuration of a JOB_QUEUE.

[Fig. 5] Fig. 5 is a diagram illustrating an example of the data configuration of the JOB_QUEUE exchanged between the STB and the printer.

[Fig. 6] Fig. 6 is a diagram illustrating exchange of data between two STBs and the printer.

[Fig. 7] Fig. 7 is a diagram illustrating controllers connected to the printer by an IEEE1394 interface.

[Fig. 8] Fig. 8 is a diagram illustrating exchange of data between the printer and either one of the controllers illustrated in Fig. 7.

[Fig. 9] Fig. 9 is a diagram illustrating exchange of data between the printer and the two controllers illustrated in Fig. 7.

[Reference Numerals]

10: parabola antenna

11: STB

11a: F/E

11b: DES

11c: I/F

11d: DEMUX

11e: AV decoder

11f: NTSC encoder

11g: CPU

11h: RAM

12: monitor

13: printer

13a: I/F

13b: CPU

13c: RAM

13d: print engine

C1, C2: controllers

P: printer

PS: SUBUNIT

Fig. 2

11a: PARABOLA ANTENNA

11e: AV DECODER

11f: NTSC ENCODER

13d: PRINT ENGINE

Fig. 3

PRINTER

Fig. 6

PRINTER

Fig. 7

C1: CONTROLLER

C2: CONTROLLER

P: PRINTER

Fig. 8

CONTROLLER

PRINTER

Fig. 9

PRINTER